

If you have any questions or comments
regarding this project contact:

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PROJECT PURPOSE

Use the Standards Technical Panel (STP) process, with participation from DG industry experts, to combine within one standard:

- 1) The appropriate product safety requirements
- 2) The necessary utility interconnection requirements using *The Standard for Interconnecting Distributed Resources with Electric Power Systems, IEEE 1547*.

This one standard will be UL1741, The Standard for Inverters, Converters and Controllers for use in Independent Power Systems.

INTENDED BENEFIT

This combination of requirements will yield a DG ANSI Standard that can be used to evaluate utility interconnected DG products for both electrical safety and utility interconnection. This one standard will simultaneously meet the concerns of Electrical AHJs and Utility Interconnection Engineers.

2003 WORK SCHEDULED OPTION YEAR 2

- Produce Third UL 1741 Draft standard by combining the STP comments from second draft with the finalized requirements from the IEEE 1547 published standard.
- Send out the third draft of UL1741 out for comments.
- Address comments and produce the Final Standard.
- Research and verify suitability of test equipment necessary to perform testing to final standard.

SUMMARY

We have completed all of the deliverables to date under the base year and option year 1 contracts. Pending funding of option year 3, we are presently on schedule for the remainder of this project.

ADDITIONAL RELATED STANDARDS WORK

Publication of both the IEEE P1547 and IEEE P1547.1 is crucial to the success of this project. Specifically, it is the intent to incorporate into UL1741 all significant requirements contained within these IEEE standards.

To ensure incorporation of significant requirements, the principal investigator of this project is the Primary Designated Engineer PDE of UL1741 and is a member of the writing committee for both the IEEE P1547 and IEEE P1547.1 documents. The urgent need for these documents in the DG industry has driven both these writing committees to maintain the same fast track pace as the IEEE P1547 working group.

It should be noted that many of the UL1741 STP members are also working group members of the IEEE P1547.1 document and this will help to ensure the future consistency between these two documents will be an ongoing process.

ANTI-ISLANDING TESTING RESEARCH

UL has done considerable research into the expansion of the Anti-Islanding test that was originally created under IEEE 929 for small single-phase PV inverters.

UL has worked with Sandia National Labs to ensure Anti-Islanding testing consistency and result reproducibility, which was a critical concern. This research has included the following:

- Comparison between air and iron core inductors.
- Comparison between various inductors with different amounts of series resistance.
- Comparison of test results gathered from both UL and Sandia Labs on the exact same product sample (round robin type testing).
- Identification of test method specific issues that can affect test results.

ANTI-ISLANDING TESTING RESEARCH

We have also reviewed the IEEE 929 Anti-Islanding test method with members of the original IEEE 929 writing committee, key manufactures, utilities, and industry consultants. This original test was written with the $Q=2.5$ (≈ 0.375 pf), which was intentionally extremely severe, intending to be above reproach by utilities, for any inverter that passed the test. The Anti-Islanding algorithms necessary to respond to a $Q=2.5$ can however, negatively affect the utility power quality. This high Q factor also leads to testing difficulties, increased test time and overall expense and may not necessarily reflect an extreme “real world” worst-case condition.

Input from utility engineers, based upon EPRI data, showed a $Q=1.8$ to be representative of a realistic “worst-case” 0.5pf load condition.

This combined research has resulted in modifying the existing anti-islanding test method to make the test more realistic and easier to apply to large, three-phase, static and rotating interconnected DG products.

SIMULATED UTILITY RESEARCH

We have worked with four different manufacturers in the design and development of a 250KVA simulated utility.

This simulated utility system is a very specialized, programmable, variable voltage and frequency AC power supply used to mimic specialized utility-fault conditions. The simulated utility is used to evaluate a utility-interconnected product's ability properly interact with a utility under normal and abnormal conditions in accordance with IEEE 1547 and UL1741.

This 250KW-simulated utility consists of two fully functional 125KW components, which will be used independently or combined together depending on the power requirements of the product being tested. This equipment is expandable to 1.25MW for future testing needs.

Prototype testing is underway and the actual simulated utility test set should be ready for test validation in March 2003 at the UL office in Northbrook, IL.

DELIVERABLES

D-2.2 (Task 6): Produce 1st Draft Standard, which was submitted to the STP members for review and comment.

Some of the topics discussed at the STP meeting, were intended to be harmonized with requirements from IEEE P1547. The IEEE 1547 document was expected to be significantly revised from the version available at the time. Therefore, UL decided to wait until those requirements were firmer before proposing them to be included in UL 1741. Furthermore, other meeting topics were found to be more complex than expected and therefore further research and development was necessary. As a result, the following topics were not addressed in the first draft of the proposed standard; Surge Testing, Controller and Relay Requirements, Synchronization Testing for Rotating Machines, THD Testing with a Simulated Utility and Transformerless Inverter Requirements. Deliverable D-2.2 was completed on May 31, 2002 and a draft document was sent electronically to all STP members on June 7, 2002.

DELIVERABLES

D-2.3 (Task 7): Review of 1st Draft, was a progress report describing the comments and responses to the first draft of the Standard. The STP comments received were consolidated and sent to NREL on September 6, 2002. A report summarizing the UL responses to the STP comments was completed on September 27, 2002.

D-2.4 (Task 8): Produce 2nd Draft Standard: was a report that included a second draft of the UL 1741 Standard. This draft incorporated comments received from the STP members and changes that align this document with the Tenth Draft Standard for Interconnecting Distributed Resources with Electric Power Systems, IEEE P1547 where possible. The standards was further expanded to address the different types of DR sources as well as busbar requirements and liquid cooling requirements for high power products. The Document was sent electronically to the STP membership for review and further comment on November 1, 2002. A shortened comment period was established for the second draft of the document.

DELIVERABLES

D-2.5 (Task 9): Review of 2nd Draft : was a progress report that described the comments and responses to the second draft of the Standard. The comments received from the Standards Technical Panel were addressed by individual responses to the commenter on December 30, 2002.

INVESTIGATION TEAM

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